

NO-BURN COAL COULD PAVE WAY FROM FOSSIL FUEL TO HYDROGEN ENERGY _____ Date: November 7,

2002 - Scientists at Los Alamos National Laboratory are seeking to perfect a process that would produce electricity from coal without actually burning it, as well as capture the carbon dioxide (CO₂) and safely return it to the earth, while at the same time eliminating all emissions of sulfur dioxide (SO₂), nitrogen oxide (NO_x) and mercury. If successful, the effort would realize the Bush administration's goals of protecting the coal industry, ensuring energy security and eliminating emissions, sources involved in the effort say. "And more broadly the process could lead to fossil fuels becoming widely used as clean sources of hydrogen for a range of purposes, such as fueling vehicles, because the gas would be produced without creating any emissions," sources say.

"A real important piece of this is addressing zero emissions from the beginning rather than through add-on technology," says a source with the Zero Emissions Coal Alliance (ZECA), an industry group that is raising money to fund the technology's development. "This takes the idea of getting clean energy from coal, oil and gas, hanging onto the carbon and putting it back in the ground. With limited Canadian government funding, the group was first formed as a non-profit with membership from U.S. and Canadian companies. One of its first efforts was to hire energy consultant Nexant to conduct a feasibility study, which found it was possible to develop the necessary technology. ZECA then formed a U.S. corporation that includes membership from companies such as Caterpillar and Southern Company. ZECA is now circulating its business plan in an effort to raise millions of dollars to build a pilot plant. A Los Alamos scientist explains that the process involves gasifying the coal with hydrogen under pressure to produce synthetic natural gas (methane), while generating heat. This gas is pumped to a second vessel where it is reacted with steam and calcium oxide (lime), to produce hydrogen and calcium carbonate (limestone). Of the hydrogen that is formed, half is sent to gasify the next batch of coal and the other half is used in a fuel cell to generate electricity. The limestone, which contains the CO₂ produced from the natural gas, is exposed to waste heat from the fuel cell, raising the temperature until the limestone breaks down and leaves a pure stream of CO₂, which is sent for sequestration. The calcium oxide remaining from the limestone is recycled back to the second vessel, to react again with the methane gas. CO₂ can be sequestered and used for enhanced oil recovery, coal bed methane production or it can be pumped deep into the ground. But the Los Alamos scientists along with the Department of Energy (DOE) are looking for a long-term approach that they are still hoping to perfect so that CO₂ is bound permanently in a stable solid and cannot leak back out into the atmosphere and cause global warming. The lab is investigating a technology that would create a reaction between the CO₂ gas and magnesium silicate, another type of rock that is plentiful throughout North America, at temperatures slightly above boiling and at high pressure, so that the rock would become magnesium carbonate, which can safely be returned to the earth. "We have not figured out how to do it completely right. We're still having to add energy to sustain the process," the Los Alamos source says. However, if sequestration is successful, the implications are huge. "It would truly be a zero-emissions plant," the scientist says. "No smokestack, no particulate emissions, no SO_x, no NO_x and all the CO₂ would be put away permanently. This is aimed at solving the issue of dirty coal once and for all, it has a major impact on

the greenhouse gas situation, and you would extend the life of conventional fossil fuels and guarantee energy security for several hundred years. The importance is tremendous. In addition to being able to produce power plants that have no smokestack and which recover all of their CO₂ emissions, in the future the process could be used as a way to make hydrogen from coal, which would be used for broader purposes such as powering fuel-cell vehicles. “Down the road, you can use the hydrogen instead of turning it into electricity, the scientist says. And while the integration process preserves coal, it also doubles efficiency so that twice the energy is realized out of the same amount of coal. The coal ash needing to be disposed would be reduced in half. The ZECA source agrees with the potential, noting that conventional wisdom has been that capturing CO₂ from a coal plant reduces efficiency. “What we’ve found is you get twice as much for the same cost. This technology makes hydrogen before you make electricity. That changes the whole paradigm,” the source says. “It allows coal to become the foundation of the hydrogen economy. Coal plants all across North American [can become] sources of cheap hydrogen.” If perfected, the same technology can fit for other fossil fuels such as oil. “You start from the idea that you design it to capture the carbon” the ZECA source says. Los Alamos scientists have been working on the process for about four years, and the scientist there says nearly every step in the process has been done in the past; they just have not been integrated in this manner. “We have identified the path to zero-emission carbon,” the ZECA source explains. “We know how to get there, but there will be a lot of twists and turns.” Source: Clean Air Report via InsideEPA.com Date: November 7, 2002 Issue: Vol. 13, No. 23 © Inside Washington Publishers CLEANAIR-13-23-19